

for the Bordin Prize, awarded for the best solution of the following question proposed in 1879 by the Academy:—"Explain by direction observation and experiment the influence exercised by the environment on the structure of the root, stem, and leaves of vegetable organisms. Study the modifications undergone in water by land plants and those experienced by aquatic plants compelled to live in the air. Explain by direct experiments the special forms of some species of marine flora."

In Agriculture the Morogues Prize was gained by M. Duclaux for his great work on "Biological Chemistry," forming part of the "Chemical Encyclopædia" published under the direction of M. Fremy.

In Anatomy and Zoology the Grand Prize granted by the Minister of Finance for the best memoir on the "Histological Development of Insects during their Metamorphoses," as proposed by the Academy, was assigned to the young naturalist, Dr. H. Viallanes, for his "Researches on the Histology of Insects, and on the Histological Phenomena accompanying the post-embryonic Development of these Animals." In the same department the Bordin Prize was awarded to M. Grand'Eury, who, in two memoirs entitled "Carboniferous Flora of the Department of the Loire and Central France," and "On the Formation of Coal," deals satisfactorily with the "Botanical or Zoological Palæontology of France or Algeria," as proposed by the Academy to competitors for this prize.

Subjoined are some of the most important prizes proposed for 1884 and following years:—

1884

BORDIN: General Study of Monge's Problem of Earth-works.

FRANCEUR: Works or discoveries useful to the progress of the pure and applied mathematical sciences.

THE EXTRAORDINARY PRIZE OF 6000 FRANCS: Studies tending to increase the efficiency of the French Naval forces.

PONCELET: Awarded to the author of the most useful work in advancing the pure or applied mathematical sciences.

PLUMEY: For improvements in steam-engines or any other invention contributing most to the progress of steam navigation.

GRAND PRIZE OF THE MATHEMATICAL SCIENCES: For any important advance in the theory of the application of electricity to the transmission of force.

VAILLANT: Fresh researches on fossils made in any region which for the last quarter of a century has been little explored from the palæontological standpoint.

DESMAZIERES: For the most useful work on the cryptogamous plants.

GRAND PRIZE OF THE PHYSICAL SCIENCES: On the mode of distribution of marine animals along the French seaboard.

1885

DELMONT: To engineers, for the best work connected with the Department of Public Works (Roads and Bridges).

FOURNEYRON: Theoretical and practical study on hydraulic accumulators and their applications.

DAMOISEAU: Review of the theory of Jupiter's satellites.

GRAND PRIZE OF THE MATHEMATICAL SCIENCES: Study of the elasticity of one or several crystallised bodies from the experimental and theoretical standpoints.

BORDIN: Researches on the origin of atmospheric electricity, and on the causes of the great development of electric phenomena in thunderstorms.

L. LACAZE: For the best treatise on physics, chemistry, and physiology.

DELESSE: For a work on geological sciences, or, failing this, on mineralogical sciences.

MONTAGNE: For important works on the anatomy, physiology, development, or description of the lower cryptogamous plants.

GRAND PRIZE OF THE PHYSICAL SCIENCES: Study of the intimate structure of the tactile organs in one of the chief natural groups of Invertebrates.

BORDIN: Comparative study of the freshwater fauna of Africa, Southern Asia, Australia, and the Pacific Islands.

GAY: Measure of the intensity of weight by the pendulum.

CUVIER: For the most important treatise either on the animal kingdom or on geology.

PETIT D'ORMOV: Pure or applied mathematical sciences and the natural sciences.

1886

DE LA FONS MEILHOCQ: For the best treatise on the flora of North France.

1887

CHAUSSIER: For important works on legal and practical medicine.

1893

MOROGUES: For the most useful work in stimulating the progress of agriculture in France.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, April 24.—"On the Relation between the Electrical Qualities and the Chemical Composition of Glass and Allied Substances." Part I. By Thomas Gray, B.Sc., F.R.S.E., and Andrew Gray, M.A., F.R.S.E., Assistant to the Professor of Natural Philosophy in the University of Glasgow, and J. J. Dobbie, M.A., D.Sc. (Edin.), Assistant to the Professor of Chemistry in the University of Glasgow. Communicated by Prof. Sir William Thomson, F.R.S.

This paper describes some further experiments as to the relation between the chemical composition of glass and its quality of resistance to electrical conduction through its substance.

The experiments were made on specimens of flint glass of different densities, made by different makers, and varying considerably in chemical composition. The method of experimenting was that described in Mr. T. Gray's paper on the same subject (*Proc. R. S.*, No. 222, 1882). Each of the specimens, which were in the form of globular flasks of nearly three inches in diameter, was filled up to the bottom of the neck with mercury, and immersed to the same level in mercury contained in an outer vessel. A wire dipping in the mercury within the flask was connected, without touching the table or any of the supports, to one terminal of a sensitive galvanometer of high resistance, and the circuit completed, through a battery of about 120 Daniell's cells, from the other terminal to the mercury in the outer vessel. (The galvanometer was well insulated, and was the high resistance astatic instrument described in *Proc. R. S.*, February 14, 1884.) The outer vessel, containing the flask, was immersed in a sand-bath which was heated by a Bunsen burner to temperatures above 100° C., and readings of the galvanometer taken at different temperatures, with precautions to insure that there was no error due to leakage. By means of a suitable reversing key in the circuit, the direction of the electrification, which lasted in each case about three minutes, was reversed between each pair of readings. From the observed deflections, and the constants of the galvanometer and battery, which were frequently determined, the resistance of the flask at each temperature could be calculated.

The results of the electrical experiments and of complete analyses of the specimens of glass are detailed in the paper, and show that the specific resistance of glass of the kinds experimented on increases with the percentage of lead contained in the glass and also with the density; and that further, as had been previously found by different experimenters, the resistance diminishes as the percentage of alkali present in the glass increases. The best specimen experimented on contained over 40 per cent. of oxide of lead, and had a density of 3.141, and a specific resistance at 130° C. of 8400×10^{10} ohms between two opposite faces of a centimetre cube. From this result, as it has been found by these and former experiments that the resistance is halved, over a considerable range of temperature, by an increase of temperature of about 8½° C., the approximate resistance of the glass at other temperatures may be found.

The paper concludes with a short statement of further work which the authors have in hand with respect to the electrical qualities of glass and minerals.

Linnean Society, May 1.—Prof. P. Martin Duncan, F.R.S., vice-president, in the chair.—Messrs. Wm. Dennison-Roebeck and F. Newton-Williams were elected Ordinary Fellows, and Profs. E. Haeckel of Jena, A. Kowalevsky of Odessa, and S. Schwendener of Berlin, Foreign Members of the Society.—Mr. S. O. Ridley exhibited and made remarks on a series of drawings of sponges (and their spiculæ) and of Actinæ drawn from the living objects, as obtained in Ceylon and forwarded by Dr. W. C. Ondaatje, F.L.S.—Prof. Jeffreys Bell also drew attention to sketches of living Ceylonese Comatulids sent by Dr. Ondaatje as an earnest of progress in researches on the marine fauna of that coast.—Mr. T. Christy showed the leaf of a China grass rich in fibre useful for textile purposes.—Mr. R. Bowdler Sharpe read a paper on a collection of birds from

the Bahr-el-Ghazal province and the Nyam-Nyam country in Equatorial Africa. The collection had been made by Herr Bohndorff, who had spent several years in travelling over the region in question, and who brought a native Nyam-Nyam with him to the Society's meeting. Mr. Sharpe gave descriptions of and remarks on new species and on little-known birds, some twenty-seven in all, these being of considerable significance in relation to their faunal distribution. He pointed out that Herr Bohndorff had apparently crossed the boundary line of two faunas, for most of the Nyam-Nyam birds assimilated to those known from the Gaboon and Congo territory; whereas those obtained in the Bahr-el-Ghazal and Nilotic region were allied to the avifauna of North-East Africa and partly of the Senegambian area. Among new species cited are *Crateropus bohndorffi*, *Sigmodes griseimentalis*, *Mesopicus strictothorax*, *Centhinochares intermedius*, *Pionias bohndorffi*, and others of equal interest.—Mr. R. A. Rolfe thereafter gave a communication on the flora of the Philippine Islands and its probable derivation. According to recent computation the phænogamic vegetation of the Philippines consists of 3564 species belonging to 1002 genera. Of 165 dicotyledonous orders 119 are represented, and of monocotyledons 25 out of 35; while the three gymnospermæ, though nominally there, are poor in number. The proportion of vascular cryptogams to phanerogams is nearly one-eighth, chiefly ferns. Of these 52 species are not known elsewhere, a fact stamping individuality on the flora. The endemic phænogamic vegetation consists of 917 species, or a proportion of over one-fourth endemic, the dicotyledons showing one-third, the monocotyledons about one-tenth. The striking feature of the flora is the large number of endemic species and the very small number of endemic genera. The flora approximates to that of the Malayan region, but very many typical Malayan genera—those even occurring on the neighbouring island of Borneo—are wanting in the Philippines. Taking into account the dominant Australian and Austro-Malayan features, along with numerous other data and reasoning, Mr. Rolfe infers that Mr. Wallace's idea of extinction of genera by submergence will not alone explain the present peculiarities of the vegetation. Mr. Rolfe looks upon the Philippines as truly insular in the essentials of their natural history, this not so much through their being an early separation from the Asiatic continent which has had a dip under the sea, as from their being largely of volcanic and geologically of somewhat recent origin.—Mr. Geo. Brook read a preliminary account of the development of the weaver fish (*Trachinus vipera*). In this he mentioned that the eggs had been laid in his aquarium at Huddersfield, the fish themselves having been kept alive therein over two years. He drew attention to the fact of there being a vitelline membrane present in the eggs of this fish, as well as in those of the herring; in contradistinction therefore to what is stated to be the case in osseous fishes generally. He also particularly referred to the persistent nature of the segmentation cavity, which is pushed round the yolk-sac concurrent with the development of the embryo from the blastoderm; and that it does not entirely disappear until the yolk is absorbed. The circulatory system, according to Mr. Brook's researches, is very late in developing, no blood-vessels appearing until several days after hatching. In illustration of his paper he exhibited under the microscope preparations showing the segmentation stage, the embryonic shield, and commencement of keel, the early embryo third day before closure of the blastopore, and fourth-day blastopore and Kupffer's vesicle, also at the eighth day, and the newly-hatched embryo.—Dr. J. Millar and Mr. J. Jenner Weir were elected auditors for the Fellows, and Mr. T. Christy and Mr. H. T. Stainton for the Council.

Mathematical Society, May 8.—Prof. Henrici, F.R.S., president, in the chair.—Mr. J. Brill was elected a member, and Prof. Luigi Cremona, of Rome, Foreign Member, was admitted into the Society.—Prof. Cremona communicated, in French, a paper entitled "Sopra una trasformazione birazionale, del sesto grado, dello spazio a tre dimensioni, la cui inversa è del quinto grado." Dr. Hirst, F.R.S., welcoming the author, spoke in commendatory terms of the value of the communication.—The following papers were also laid before the Society:—Motion of a network of particles with some analogies to conjugate functions, by E. J. Routh, F.R.S.—On a subsidiary elliptic function, by J. Griffiths.—On the homogeneous equation of a plane section of a geometrical surface, by J. J. Walker, F.R.S.—On the "symmedian-point" axis of a system of triangles, and on another line which is connected with a plane triangle, by R. Tucker.

Chemical Society, May 1.—Dr. W. H. Perkin, F.R.S., president, in the chair.—The following papers were read:—On benzoylactic acid and some of its derivatives (part i.), by W. H. Perkin, jun. For various reasons the author determined to examine carefully benzoylactic ether with special reference to reactions in which the ketone group takes part. Full details of the preparation of this body, which boils at 265° to 270°, and gives a violet coloration with ferric chloride, are contained in the paper. When boiled with dilute sulphuric acid, it splits up into acetophenone, alcohol, and carbonic anhydride. The barium, silver, copper, and lead salts were prepared. The paper contains an account of the preparation and properties of the following bodies: Benzoylactic acid, ethylbenzoylactic acid, diethylbenzoylactic acid, allylbenzoylactic acid, the corresponding ethers and their decomposition products, and an investigation of the action of bromine on allylacetophenone.—The composition of coal and canal gas in relation to their illuminating power, by P. F. Frankland. In this paper the author gives the results of a detailed examination of the gas supplied to some of the more important towns of the United Kingdom. The constituents which have been determined are the hydrocarbons absorbed by fuming sulphuric acid, carbonic anhydride, oxygen, nitrogen, hydrogen, carbonic oxide, and marsh gas. The results are compared with previous analyses in 1851 and 1876.—On selenium sulphoxide; on the reaction between hydrogen chloride and selenium sulphoxide; on selenium selenochloride, by E. Divers and Masachika Shimosé.—On a new form of pyrometer, by T. Carnelly and T. Burton. This consists essentially of a coil of copper tube, which is placed in the furnace, oven, &c.; through this coil flows a constant current of water; the temperature of the oven is estimated by the difference between the temperature of the water as it flows into and issues from the coil.—On fluorene, by W. R. Hodgkinson. During the fractional distillation of fluorene the formation of an orange-red substance was noticed; this seemed likely to be an oxidation product, and in the present paper the author gives an account of his attempt to isolate this body, which is rendered extremely difficult, as the substance decomposes when distilled in a vacuum, and is equally soluble with the hydrocarbons which accompany it.

Institution of Civil Engineers, April 22.—Sir J. W. Bazalgette, president, in the chair.—The paper read was on the comparative merits of vertical and horizontal engines, and on rotative beam-engines for pumping, by Mr. Wm. E. Rich.

EDINBURGH

Royal Physical Society, April 23.—Dr. Ramsay H. Traquair, F.R.S., president, in the chair.—Mr. Hugh Miller, of H.M. Geological Survey, read a paper on boulder glaciation and striated pavements, an abstract of which was given in these columns on May 1 (p. 23).—The President gave an outline of a paper by Mr. J. T. Richards, on Scottish fossil cycadaceous leaves contained in the Hugh Miller collection.—Mr. J. R. Henderson exhibited various mollusks and zoophytes from the Firth of Forth.—Mr. Henry Gunn, A.R.S.M., contributed a paper on the silver districts of Colorado (Leadville and San Juan). In the first portion of the paper, which dealt with the Leadville deposits, the author pointed out that within a limited thickness of from 700 to 1000 feet, typical representatives of Laurentian, Cambrian, Silurian, and Carboniferous rocks were to be found, and also indicated the influence which intrusive rocks had in the economic geology of the district, inasmuch as all the deposits occurred at the contact of the quartz porphyry with the limestones. Specimens illustrative of the ores mined in the district were exhibited, also some possessing unusual associations of mineral, a specimen showing granules of free gold in hard carbonate of lead attracting much attention from the fact that it was the only specimen ever discovered in the district exhibiting this association. Mr. Gunn exhibited specimens of tellurium ores of remarkable beauty, and a sample of zinc blende mined in large quantity in Pitkin County, which, contrary to the opinion generally held by miners, contained large quantities of silver. The second portion of the paper dealt with the San Juan district, and after indicating the peculiar disadvantages under which this district laboured for the first few years of its existence, proceeded to describe the geology of the district, which, he states, to be Trachyte overlying rocks of Carboniferous and Devonian age. The mineral is found in true fissure veins of great width, chiefly composed of quartzose matter, but usually carrying one or more gray streaks from two to six feet wide, composed of

galena, fahlertz, and sulphurets of silver and gold. Some of the mines produce beautiful filaments of native silver, and one of the specimens showed a very unusual association, viz. fine filaments of silver on gray copper.—The Secretary (Robert Gray, V.P.R.S.E.) exhibited a specimen of the Calandra lark (*Alauda calandra*) from the neighbourhood of Madrid, showing a peculiar malformation of both mandibles, which seemed to render it impossible for the bird to pick up its food. The specimen had been sent to him by Dr. A. C. Stark, and is to be deposited in the Edinburgh Museum of Science and Art.—Mr. Gray also reported the occurrence of at least three instances of the stock dove (*Columba anas*) in Roxburghshire, and made some remarks on the distribution of the species in the border counties. This bird has now been found to be a regular visitant to the counties of Berwick, Dumfries, and Roxburgh, in all of which it breeds.—Mr. Harvie-Brown, F.R.S.E., F.Z.S., exhibited, with remarks, a specimen of the black redstart (*Ruticilla titys*, Scop.), taken last month on the Pentland Skerries, Pentland Firth. The specimen was a male adult, and is said to be the fifth of the species recorded in Scotland.

Mathematical Society, May 9.—Dr. Thomas Muir, F.R.S.E., president, in the chair.—Prof. Crum Brown delivered an address, interesting alike to mathematicians and to chemists, on the hypothesis of Le Bel and Van't Hoff.—Dr. Muir gave a preliminary account of a treatise on Determinants, published in 1825, and unknown to all writers on the history of the subject.

DUBLIN

Royal Society, April 21.—Section of Physical and Experimental Science.—Arthur Hill Curtis, LL.D., in the chair.—Notes from the Physical Laboratory of the Royal College of Science, by Prof. W. F. Barrett.—On the local heliostat, by G. Johnstone Stoney, D.Sc., F.R.S. This instrument was designed by the author many years ago, and made for him most satisfactorily by Messrs. Spencer and Sons, opticians, of Dublin, who have since constructed several reproductions of it for physicists at home and abroad, at the suggestion of one of whom it is now described. The instrument is in some degree a modification of Gambey's heliostat, but it differs from that apparatus by being simpler in its details, steadier, easier to use, and cheaper. These advantages are gained by sacrificing the generality of Gambey's instrument and providing only for stations within a limited range of latitude, usually about 10°, which, for example, enables one instrument to be used anywhere within the British Islands. Hence it has been called the local heliostat. The adjustment for latitude is of the simplest kind. After it is made, the instrument is to be levelled, and an arrangement based on the principle of the sun-dial enables it in about half a minute to be placed in the meridian. A polar axis is driven by a common clock at the rate of one revolution in twenty-four hours. To the upper end of this axis an arm is jointed, which, by a simple contrivance, can be pointed towards the sun, and which the clockwork, while in action, will then cause to follow that luminary. This arm trammels the mirror in the same way as in Gambey's instrument; and the reflected ray continues in the direction of a bar which can be placed in any azimuth and can be inclined up or down within reasonable limits. The direction of this bar, and with it of the reflected ray, can be readjusted, if necessary, in one or two seconds without disturbing the rest of the apparatus. The local heliostat has hitherto been made with mirrors about six inches by three for use in physical laboratories, but the design has been rendered so simple that it could be made at small cost with a mirror as large as a toilet glass, and driven by a cheap common clock. This would furnish an instrument which might be employed in physiological experiments on plants, in photography, and for any other purposes in which a large sunbeam in a fixed direction would be useful.—Dr. C. E. Fitzgerald exhibited Mr. P. Smith's model illustrating the conjugate movement of the eyes.

Section of Natural Science.—V. Ball, M.A., F.R.S., in the chair.—The following papers by D. Sharp, M.B., were communicated by Prof. W. R. McNab, M.D.:—(1) Descriptions of new genera and species of Hawaiian Coleoptera; (2) Catalogue of Hawaiian Coleoptera, with localities, distribution, and habits; (3) Topographical table of Hawaiian Coleoptera, with summaries, generalisations, and comments.—Prof. A. C. Haddon, B.A., F.Z.S., on the generative and urinary ducts in Chitons. The author discussed the various views as to the nature of the urinary ducts in Chitons. His own investigations supported Sedgwick's account as opposed to Haller's, and an oviduct was proved to

exist in *Ch. (Trachydermon) ruber*, Linn.—Notes on some of the Irish crystalline iron ores, by G. H. Kinahan, M.R.I.A.—Additional notes on the phenomena attending the eruption of Krakatoa, by J. Joly, B.E. These included an account, received from Capt. Thomson of the *Medea*, relating to phenomena observed on August 22 to 24, while the *Medea* was in the Sunda Straits. These embraced electrical effects, showers of sand and gravel, &c. At 2 p.m. on the 26th Capt. Thomson heard the first explosion; others succeeded every ten minutes. This geyser-like regularity was substantiated by all accounts received by the author. A column of dust arose to the westward immediately after the first explosion. Two observations enabled the height of this column to be computed. One gave seventeen, another twenty-one miles. The last included some doubtful factors, the observation being made three hours after first explosion. Further examination of the dust and pumice revealed hematite in thin blood-red flakes. The feldspars seemed divisible into two groups depending on optical and structural differences. Pyrites occurred not alone as an inclusion in the feldspars but also in the hypersthene. Optical tests rendered highly probable the presence of a triclinic pyroxene.

MANCHESTER

Literary and Philosophical Society, March 4.—H. E. Roscoe, F.R.S., president, in the chair.—A paper was read on the production and purification of gaseous fuel for industrial purposes, with the results of several large applications of a system, by W. S. Sutherland.

March 18.—H. E. Roscoe, F.R.S., president, in the chair.—Notes on the meteorology and hydrology of the Suez Canal, by Dr. W. G. Black, F.R.Met.S.

VIENNA

Imperial Academy of Sciences, April 24.—F. von Hochstetter, fifth communication to the seventh report of the Prehistoric Commission; on the tumuli at Froeg, near Rosegg (Carinthia).—K. Zulkorsky, on the aromatic acids as dye-forming matters.—W. Stephanie, on rotation of the moon.—T. Unterweger, on the aurora borealis.—T. Habermann and M. Heenig, on the action of cuprum hydroxide on some sugars.—F. Berger, on the preparation of phenylcyanide.—E. Spiegler, contribution to a knowledge of the euxanthone group.—Contribution to a knowledge of diphenylglucetoxin, by the same.—T. von Hepperger, on the position and figure of isochrones in comets' tails.

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